

Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 048 246 A1**

(12) **EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 158(3) EPC

(43) Date of publication:  
**02.11.2000 Bulletin 2000/44**

(21) Application number: **98955926.5**

(22) Date of filing: **25.11.1998**

(51) Int. Cl.<sup>7</sup>: **A47C 7/28**

(86) International application number:  
**PCT/JP98/05307**

(87) International publication number:  
**WO 99/26519 (03.06.1999 Gazette 1999/22)**

(84) Designated Contracting States:  
**DE FR GB**

(30) Priority: **25.11.1997 JP 33934097**  
**26.12.1997 JP 36822297**  
**19.03.1998 JP 9091798**

(71) Applicants:  
• **TS Tech Co., Ltd**  
**Asaka-shi, Saitama 351-0012 (JP)**  
• **Honda Giken Kogyo Kabushiki Kaisha**  
**Minato-ku, Tokyo 107-0062 (JP)**

(72) Inventors:  
• **MAEDA, Minoru,**  
**Technical Center, TS Tech Co., Ltd**  
**Shioya-gun, Tochigi 329-1217 (JP)**  
• **SHOJI, Tomomi,**  
**Technical Center, TS Tech Co., Ltd**  
**Shioya-gun, Tochigi 329-1217 (JP)**

• **MATSUZAKI, Tsutomu,**  
**Technical Center, TS Tech Co. Ltd**  
**Shioya-gun, Tochigi 329-1217 (JP)**  
• **TAKAHASHI, Naohiro,**  
**K.K. Honda Gijyutsu Kenkyusho**  
**Saitama 351-0113 (JP)**  
• **ISHII, Masashi,**  
**K.K. Honda Gijyutsu Kenkyusho**  
**Saitama 351-0113 (JP)**  
• **AO, Tsutomu,**  
**K.K. Honda Gijyutsu Kenkyusho**  
**Saitama 351-0113 (JP)**

(74) Representative: **Pontet, Bernard**  
**Pontet Allano & Associés s.e.l.a.r.l.**  
**25 rue Jean-Rostand**  
**Parc Club Orsay Université**  
**91893 Orsay Cédex (FR)**

(54) **SEAT HAVING SEAT SURFACE OF PLANAR ELASTIC BODY**

(57) A seat having a seat surface of a planar elastic body, comprising a seat frame (1) of a substantially quadrilateral frame body, a planar elastic body (2) forming a seat surface portion, a pad member (3) forming a greatly bulging bank portion, and a facing member (4) covering the pad member (3), the planar elastic body (2) being spread within the seat frame (1) with one end portion of the facing member (4) applied and fixed to an outer surface of the frame body of the seat frame (1), the pad member (3) being fixed on an outer surface of the seat frame (1) while covering the mentioned end portion of the facing member (4) therewith, the facing member (4) being put on an outer surface of the pad member (3) from the mentioned end portion thereof applied and fixed to the frame body of the seat frame (1), the other end portion of the facing member (4) being wound onto and fixed to a rear portion of the seat frame (1) to thereby form the bank portion which bulges higher than the seat surface portion formed of the planar elastic body (2) spread within the seat frame (1), and which is assembled to a simple and strong structure, the pad member (3) preventing the seat frame (1) from contact-

ing a person sitting on the seat, whereby the seat does not give him a feeling of physical disorder.

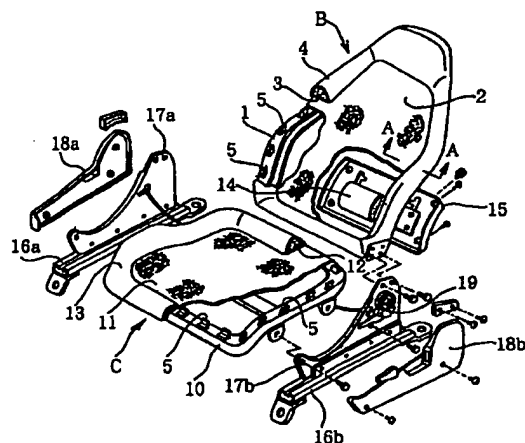


FIG. 1

EP 1 048 246 A1

## Description

### BACKGROUND OF THE INVENTION

[0001] The present invention relates to an improvement of a seat including a seat frame comprising a substantially quadrilateral frame body, in which a seating face is made of sheet resilient material by stretching a net-like sheet resilient body within the frame of the seat frame.

[0002] A seat forming a seating face by stretching net-like sheet resilient material within a frame of a seat frame has already been proposed (U.S.P. 5,013,089, U.S.P. 5,533,789 and Japanese Patent Application Laid-open No.HB-507935).

[0003] Since the seating face of the seat is formed of the sheet resilient material, it is possible to change the design of the seat from a normal seat, and not only the cushion properties but also breathability can be applied to the seating face, and furthermore, a pad member, a spring member and the like which constitute the seating face can be omitted, the weight can be lightened, the assembled seat has excellent space efficiency due to the thin thickness of the sheet resilient material.

[0004] When the sheet resilient material is stretched within the frame of the seat frame of the sheet resilient material, in the case of the previously proposed seat, a resin plate is mounted to an end of the sheet resilient material and is fitted in a recess formed on an axial of the seat frame, thereby fixing the end of the sheet resilient material, or the end of the sheet resilient material is directly wound around the axis of the seat frame and fixed together with a push plate by screw.

[0005] However, bank can not be provided almost at all in the seat and thus, holding properties of a sitting passenger is inferior. Further, a hard resin plate or the push plate is located around the frame, such hard resin plate or the push plate contacts the sitting passenger and thus he or she may feel a sense of incongruity, which is not preferable.

[0006] It is an object of the present invention to provide a seat having a seating face made of sheet resilient material capable of exhibiting excellent sitting properties in which a strong bank which largely rises from the seating surface made of the sheet resilient material is assembled with a simple structure, and holding properties of the sitting passenger can be improved.

### SUMMARY OF THE INVENTION

[0007] A seat having a seating face made of sheet resilient material of the present invention is assembled from a seat frame comprising a substantially quadrilateral frame body, the sheet resilient material forming the seating face, a pad member forming a largely rising bank, and a skin material enclosing the pad member, wherein the sheet resilient material is stretched within a

frame of the seat frame, one end of the skin material is abutted against and fixed on a frame body of the seat frame, the one end of the skin material is covered and the member is assembled outside the seat frame, the skin material covers outside of the pad member from the one end which is abutted against and fixed on the frame body of the seat frame, and the other end is wound and stopped around the back of the seat frame.

[0008] According to this seat having the seating face made of sheet resilient material, the bank which rises larger than the seating surface of the seating face made of the sheet resilient material which is stretched within the frame of the seat frame is formed and thus, it is possible to enhance the holding properties of the sitting passenger. Further, the pad member which is assembled outside the seat frame is covered with the skin material having the one side which is abutted against and fixed to the frame body of the seat frame and the other end wound around and stopped at the back of the seat frame and therefore, the bank which rises larger than the seating surface of the seating face made of the sheet resilient material can be assembled strongly with a simple structure. Further, the pad member covers the seat frame including the end of the sheet resilient material stopped at the seat frame and the one end of the skin material which is abutted against and fixed on the frame body of the seat frame and thus, the pad member prevents the seat frame from touching a sitting passenger so that the sitting passenger should not feel a sense of incongruity.

[0009] The present invention includes various features which will be apparent from the following detailed description.

### BRIEF DESCRIPTION OF THE DRAWINGS

#### [0010]

Fig. 1 is a development perspective view of the entire seat having a seating face made of sheet resilient material according to a first embodiment of the present invention, Fig. 2 is a partial sectional view showing the developed various parts constituting the seat shown in Fig. 1, Fig. 3 is a sectional view taken along the line A-A in Fig. 1, Fig. 4 is a sectional view showing another seat frame used for constituting the seat shown in Fig. 1, Fig. 5 is an explanatory view showing another resin plate used for constituting the seat shown in Fig. 1, Fig. 6 is a sectional view showing the developed various parts constituting a seat according to a second embodiment of the present invention, Fig. 7 is a sectional view showing the assembled state of the various parts shown in Fig.6, Fig. 8 is a sectional view showing the developed various parts constituting a seat according to a third embodiment of the present invention, Fig. 9 is an explanatory view showing forming procedure of resin of the seat frame consti-

tuting the seat shown in Fig. 9, and Fig. 10 is a sectional view showing the assembled state of the various parts shown in Fig. 8.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The present invention will be explained in detail with reference to the accompanying drawings.

[0012] As illustrated modes for carrying out the present invention, there are a first embodiment shown in Figs. 1 to 5, a second embodiment shown in Figs. 6 and 7, and a third embodiment shown in Figs. 8 to 10.

[0013] Each of the embodiments is applied to the assemble of a seat back B and a seat cushion C of a vehicle as shown in Fig. 1. Each of the seat back B and the seat cushion C of the vehicle seat is assembled from a substantially quadrilateral frame-like seat frame 1, 10, a sheet resilient material 2, 11, forming a seating face, a pad member 3, 12, forming a largely rising bank, and a skin material 4, 13, covering the pad member 3, 12.

[0014] The concrete structure will be explained based on the seat back B. In the first embodiment shown in Fig. 2, a metal frame having U-shaped cross section whose inner side is opened is used as the seat back frame 1. The seat back frame 1 is bent in the axial direction such that each of sides forming the substantially quadrilateral shape of the seat back frame 1 fits to a contour of a sitting passenger.

[0015] The seat back frame 1 is provided with a plurality of locking pawls 5 ... used for stretching the sheet resilient material 2 within the frame as will be described later. The locking pawls 5 ... are so-called "retainers", and are mounted at a distance from one another by welding on a frame surface closer to an outer peripheral edge on the side on which the sheet resilient material 2 is stretched.

[0016] A cloth having breathability is used as the sheet resilient material 2. For example, a cloth formed of a plurality of elastomer monofilaments waven by a plurality of strands such as fiber yarn used for interior cloth, a cloth or a knit to which elasticity and breathability are applied by weaving or knitting 1000 to 4000-denier elastomer monofilament to the warp or the weft can be used as the sheet resilient material 2.

[0017] The sheet resilient material 2 is integrally formed around its periphery with a resin plate 6 made of PET, PP or the like. The resin plate 6 inserts the edge of the sheet resilient material 2 into a thick portion so that they are integrally formed by injection forming, thereby stretching the sheet resilient material 2 from its periphery.

[0018] The resin plate 6 is formed at its plate surface with a plurality of slits 6a ... positioned in correspondence with the locking pawls 5 ... of the seat back frame 1, and a plurality of boss-like projections 6b...each having pedestal and rises from the plate sur-

face at a distance from one another.

[0019] The pad member 3 is a cushion foam body such as forming urethane, and is provided with a recess in which a front surface, side surface and a back surface of the seat back frame 1 are fitted and fixed from outside, and is formed into a predetermined cubic shape. The pad member 3 may be individually formed for each side of the seat back frame 1, or the entire pad member 3 may be continuously and integrally formed in the frame shape of the seat back frame 1. The front side of the pad member 3 largely rises such as to assemble the bank having excellent holding property and especially, a portion thereof from its intermediate portion to the lower portion of both the sides largely rises, and the upper portion largely rises as a head rest portion.

[0020] As the skin material 4, any material such as a general real leather, a synthetic leather or fabric can be used. The entire skin material 4 may be sewn and formed into a continuous integral material such that the pad member 3 assembled to each side of the seat back frame 1 is enveloped from the outer side thereof by a substantially C-shaped cross section whose inner side is opened.

[0021] A reinforcing cord 7, that is, a so-called "trim cord" is sewn to the skin material 4 along an end wound and stopped at the front surface side of the seat back frame 1. The reinforcing cord 7 is provided with a plurality of vent holes 7a, 7b ... located in correspondence with the projections 6b ... of the supporting plate 6 at a distance from one another in the longitudinal direction.

[0022] When assembling the seat back B from the above-described various members, as shown in Fig. 3, the locking pawls 5 ... of the seat back frame 1 are inserted into the slits 6a ..., projecting ends of the locking pawls 5 ... are bent outward of the seat back frame 1, the resin plate 6 is abutted against and fixed to the front surface side of the seat back frame 1, thereby stretching the sheet resilient material 2 within the frame of the seat back frame 1. Next, the projections 6b... of the resin plate 6 are fitted into the vent holes 7a, 7b ... of the reinforcing cord 7, the projecting end side of the projections 6b... are subjected to heat caulking or super-sonic wave caulking, the reinforcing cord 7 is sandwiched between the pedestals of the projections 6b and the caulked and deformed head portion so that one end of the skin material 4 is stopped and fixed at the front surface side of the seat back frame 1.

[0023] After the resin plate 6 to the sheet resilient material 2 and the one end of the skin material 4 are mounted to the seat back frame 1, the pad member 3 is assembled to each of the sides of the seat back frame 1 from outside such as to cover the one end of the skin material 4 and the seat back frame 1. Further, the skin material 4 is wound to the back surface side of the seat back frame 1 from the one end which is stopped and fixed to the seat back frame 1 so as to enclose the pad member 3. This skin material 3 can be stopped at the end by sewing a hook 8 made of hard resin along the

end at the side of winding side, and by hanging the hook 8 on the flange of the seat back frame 1.

[0024] In the seat back structured as described above, since the seating face is made of the sheet resilient material 2 using the seat back frame 1 as a base and the pad member 3 is formed with the largely rising bank, it is possible to hold the sitting passenger stably. The peripheral edge of the sheet resilient material 2 is embedded in the thick portion, the resin plate 6 for stretching and holding the sheet resilient material 2 from the periphery is abutted against and fixed to the seat back frame 1 by the locking pawls 5 ..., the one end of the skin material 4 is abutted against and fixed to the seat back frame 1 by the projections 6b ... and thus, it is possible to assemble the seat strongly with a simple structure. Further, the pad member 3 assembled to the seat back frame 1 covers the seat back frame 1 of course, and covers the one end of the skin member 4 including the resin plate 6 holding the end of the sheet resilient material 2. Therefore, a sense of incongruity due to the resin plate 6 and the seat back frame 1 should not be applied to the sitting passenger.

[0025] As the seat frame 1, a square pipe member as shown in Fig. 4 can be used instead of the above described frame having U-shaped cross section. In such a case, the skin material may be formed at its back surface with a back (not shown) which can open and close by a slide fastener or the like.

[0026] Further, the resin plate 6 may be provided at its opposite sides with rising flanges 6c, 6d as shown in Fig. 5. Since the rising flanges 6c, 6d fitted to the opposite sides of the seat frame 1, it is possible to accurately position the resin plate 6 and easily assemble the resin plate 6 to the seat frame 1.

[0027] In the above-described embodiment, the resin plate 6 for stretching and holding the sheet resilient material 2 from the periphery is abutted against and fixed to the seat back frame 1 by the locking pawls 5 ..., and the one end of the skin material 4 is abutted against and fixed to the seat back frame 1 by the projections 6b ... . As a second embodiment, as shown in Fig. 6, the skin material 4 can be abutted against and fixed to the seat back frame 1 by engaging the reinforcing cord 7 with the locking pawls 5 ... together with the resin plate 6.

[0028] The resin plate 6 is provided with a plurality of slits 60a, 60b as elongated holes in positions corresponding to the locking pawls 5 ... of the seat back frame 1 in the longitudinal direction. The reinforcing cord 7 is provided with a plurality of slits 70a, 70b... in positions corresponding to the slits 60a, 60b ... of the resin plate 6 in the longitudinal direction.

[0029] When the seat back B is assembled from each of the members, the rising flanges 6c, 6d of the resin plate 6 are engaged with the opposite sides of the seat back frame 1, and the resin plate 6 of the sheet resilient material 2 is abutted against the frame surface of the sheet back frame 1 and is disposed. At that time,

the locking pawls 5... are fitted in the slits 60a, 60b of the resin plate 6.

[0030] Next, the reinforcing cord 7 of the skin material 4 is superposed on the resin plate 6 of the sheet resilient material 2, the tip ends of the locking pawls 5... projecting from the slits 60a, 60b of the resin plate 6 are fitted to the aligned slits 70a, 70b of the reinforcing cord 7, the projecting end are bent outward of the seat back frame 1, and the resin plate 6 and the reinforcing cord 7 are fastened fixed together at the side of the front surface of the seat back frame.

[0031] With the above operation, as shown in Fig. 7, the sheet resilient material 2 can be stretched and held within the frame of the seat back frame 1 by the resin plate 6 such as to form the seating face. Further, since the seating face is made of the sheet resilient material 2 using the seat back frame 1 as a base and the pad member 3 is enclosed by the skin material 4 which fixes the one end at the front surface side of the seat back frame 1, the bank which rises larger than the surface position of the seating face made of the sheet resilient material 2 can be assembled strongly with a simple structure.

[0032] In the first and second embodiments, the metal frame having the U-shaped cross section or the square pipe member is used as the seat back frame 1, and the sheet resilient material 2 is stretched and held from the periphery by the resin plate 6. In a third embodiment, as shown in Fig. 8, a metal pipe frame 1a is used as a base frame, the pipe frame 1a is embedded in the seat back frame 1, the frame body 1b in which the peripheral edge of the sheet resilient material 2 is incorporated holds the sheet resilient material 2 at a predetermined tensile strength from the periphery. The frame body 1b and the pipe frame 1a are integrally formed of resin into the seat back frame 1.

[0033] Further, instead of the structure in which the resin plate 6 is abutted against and fixed to the seat back frame 1 by the locking pawls 5 ... and the one end of the skin material 4 is abutted against and fixed to the seat back frame 1 by the projection 6a, or the reinforcing cord 7 is engaged with the locking pawls 5 ... together with the resin plate 6 and is abutted against and fixed to the seat back frame 1, it is possible to employ a structure in which the one end of the skin material 4 is abutted against and fixed to the seat back frame 1 by the projections 1c ... projecting from the frame body 1b.

[0034] The frame body 1b can be formed of synthetic resin such as polyethylene terephthalate, polypropylene and polyethylene by the injection forming.

[0035] When the frame body 1b is integrally formed of resin with the sheet resilient material 2, as shown in Fig. 9, the sheet resilient material 2 is sandwiched by a fastener P from the periphery, and is stretched and supported with predetermined tensile strength, the peripheral end edge of the sheet resilient material 2 is accommodated in a cavity P of an upper die W<sub>1</sub> and a lower die W<sub>2</sub> together with the pipe frame 1a, and is

subjected to the injection forming.

[0036] The projections 1c ... for stopping the one end of the skin material 4 and a receiving groove 1d in which a locking plate of the skin material 4 which will be described later are formed by the injection forming on the frame body 1b along the axial direction of the pipe frame 1a. After the injection forming, the sandwiched portion of the sheet resilient material 2 by the fastener P may be cut and removed as reminder portion by heat cutting along the side edge of the frame body 1 since the sandwiched portion becomes frayed.

[0037] The frame body 1b is integrally formed of resin with the pipe frame 1a. The frame body 1b is formed of resin for taking in the peripheral end edge of the sheet resilient material 2 to stretch and support the sheet resilient material 2 with the predetermined tensile force from periphery. Therefore, it is possible to stretch the sheet resilient material 2 within the frame of the seat back frame 1 while keeping moderate and constant tensile strength evenly.

[0038] In the case of this seat back frame 1, as in the first embodiment, the reinforcing cord 7 provided with the plurality of vent holes 7a, 7b ... located in correspondence with the projections 1c ... of the frame body 1b may be sewed on the skin material 4 along the one end which is wound and stopped around the front surface side of the seat back frame 1, and a hanging plate 9 made of resin may be mounted along the other end.

[0039] To assemble the seat back B from each of the members, the resin plate 7 of the skin material 4 is abutted against the front surface side of the frame body 1b. the projections 1c ... are fitted in the vent holes 7a, 7b ..., the projecting ends of the projections 1c ... are caulked by supersonic wave welding, thermal welding or crush caulking, thereby stopping the one end of the skin material. Next, the pad member 3 is incorporated to the seat back frame 1 and enclosed by the skin material 4 such that the pad member 3 comes inside of the skin material 4, and the hanging plate 9 provided at the other end of the skin material 4 is fitted in the receiving groove 1d of the resin frame 1b and fixed.

[0040] With the above operation, as in the first and second embodiment, using the seat back frame 1 as a base, the seating face can be formed of the sheet resilient material 2 which is stretched within the frame of the seat back frame 1 while keeping the constant tensile force, and it is possible to assemble, with a simple structure, the strong seat back B having the bank which rises larger than the surface position of the seating face made of the sheet resilient material 2 from the skin material 4 enclosing the pad member 3.

[0041] As shown in Fig. 1, this seat back is provided with a lumber support 14 whose position can vertically be adjusted by a back cover 15, the back cover 15 is mounted to a lower portion of back surface of the seat back frame 1 so that the seat back can be constituted as a seat back having a back cover and keeping the breathability by the upper portion.

[0042] The above-described embodiment has been described based on the seat back B, but it can similarly be applied for constituting the seat cushion C.

[0043] In the seat having the seating surface made of the sheet resilient material, the seat cushion C is mounted to bracket plates 17a, 17b slidably and uprightly supported by slide rails 16a, 16b, the bracket plates 17a, 17b are covered with exterior covers 18a, 18b, whereby the seat can be constituted in the same manner as a normal seat which can be adjusted in position in the longitudinal direction. Further, if the one bracket plate 17b is provided with a reclining mechanism 19, the seat can be constituted as a reclining seat.

#### POSSIBILITY OF INDUSTRIAL UTILIZATION

[0044] As described above, according to the seat having the seating face made of the sheet resilient material of the present invention, it is possible to form the bank which rises larger than the seating face made of the sheet resilient material which is stretched within the frame of the seat frame by the pad member which is assembled to the seat frame and covered with the skin material, it is also possible to enhance the holding properties of the passenger, one end is abutted against and fixed to the frame body of the seat frame, and the pad member assembled outside the seat frame is covered with the skin material which wounds and stops the other end around the back of the seat frame. Therefore, it is possible to assemble the strong bank which rises larger than the seating face made of the sheet resilient material with a simple structure and further, by covering the seat frame with the pad member, the sitting passenger should not feel a sense of incongruity and thus, the present invention is suitable for constituting the seat for an automobile.

#### Claims

1. A seat having a seating face made of sheet resilient material, assembled from a seat frame comprising a substantially quadrilateral frame body, said sheet resilient material forming said seating face, a pad member forming a largely rising bank, and a skin material enclosing said pad member, wherein said sheet resilient material is stretched within a frame of said seat frame, one end of said skin material is abutted against and fixed on a frame body of said seat frame, said one end of said skin material is covered and said member is assembled outside said seat frame, said skin material covers outside of said pad member from said one end which is abutted against and fixed on said frame body of said seat frame, and the other end is wound and stopped around the back of said seat frame.
2. A seat having a seating face made of sheet resilient material according to claim 1, further comprising a

plurality of locking pawls projecting on a frame surface of said seat frame at a predetermined distance from one another, wherein said sheet resilient material is provided around its peripheral edge with a resin plate which is provided at its plate surface with a plurality of slits located in correspondence with said locking pawls on the seat frame, respectively, and with a plurality of projections rising at a distance from one another, said skin material is provided at its end with a reinforcing cord having a plurality of vent holes located in correspondence with said projections of said resin plate,

said resin plate is mounted to said seat frame by said locking pawls which is inserted into said slits and bent so that said sheet resilient material is stretched within said frame of said seat frame, said reinforcing cord is mounted to said resin plate by said projection which are fitted into said vent holes and caulked, and said one end of said skin material is connected and fixed to said seat frame.

3. A seat having a seating face made of sheet resilient material according to claim 1, further comprising a plurality of locking pawls projecting on a frame surface of said seat frame at a predetermined distance from one another, wherein said sheet resilient material is provided at its peripheral edge with a resin plate which is provided at its plate surface with slits located in correspondence with said locking pawls of said seat frame, said skin material is provided at its one end with a reinforcing cord provided slits at positions aligned with said slits of said resin plate,

said resin plate of said sheet resilient material is abutted against and disposed on a frame surface of said seat frame, said reinforcing cord of said skin material is superposed on said resin plate of said sheet resilient material, hanging pawls of said seat frame are fitted in said slits of said resin plate and said reinforcing cord which are aligned with each other, said hanging pawls are bent, and said resin plate and said reinforcing cord are fastened and fixed to said seat frame.

4. A seat having a seating face made of sheet resilient material according to claim 2 or 3, wherein said sheet resilient material is integrally formed of resin at its peripheral edge with said resin plate.
5. A seat having a seating face made of sheet resilient material according to any one of claims 2 to 4, wherein said resin plate is provided along opposite sides thereof with rising flanges which engage opposite side surfaces of said seat frame.

6. A seat having a seating face made of sheet resilient material according to claim 1, wherein said sheet resilient material is fixed and held by a substantially quadrilateral frame body which is integrally formed of resin with the peripheral edge of said sheet resilient material, said frame body is used as said seat frame, and said sheet resilient material is stretched within the frame of said seat frame.

7. A seat having a seating face made of sheet resilient material according to claim 6, wherein a plurality of projections rising at a constant distance from each other are projecting on said seat frame of said seat frame, said skin material is provided at its end with a reinforcing cord having a plurality of vent holes in positions in correspondence with projections of said seat frame,

said reinforcing cord is fitted in said vent holes and is mounted to said frame body by caulking projections, said one end of said skin material is connected and fixed to said seat frame.

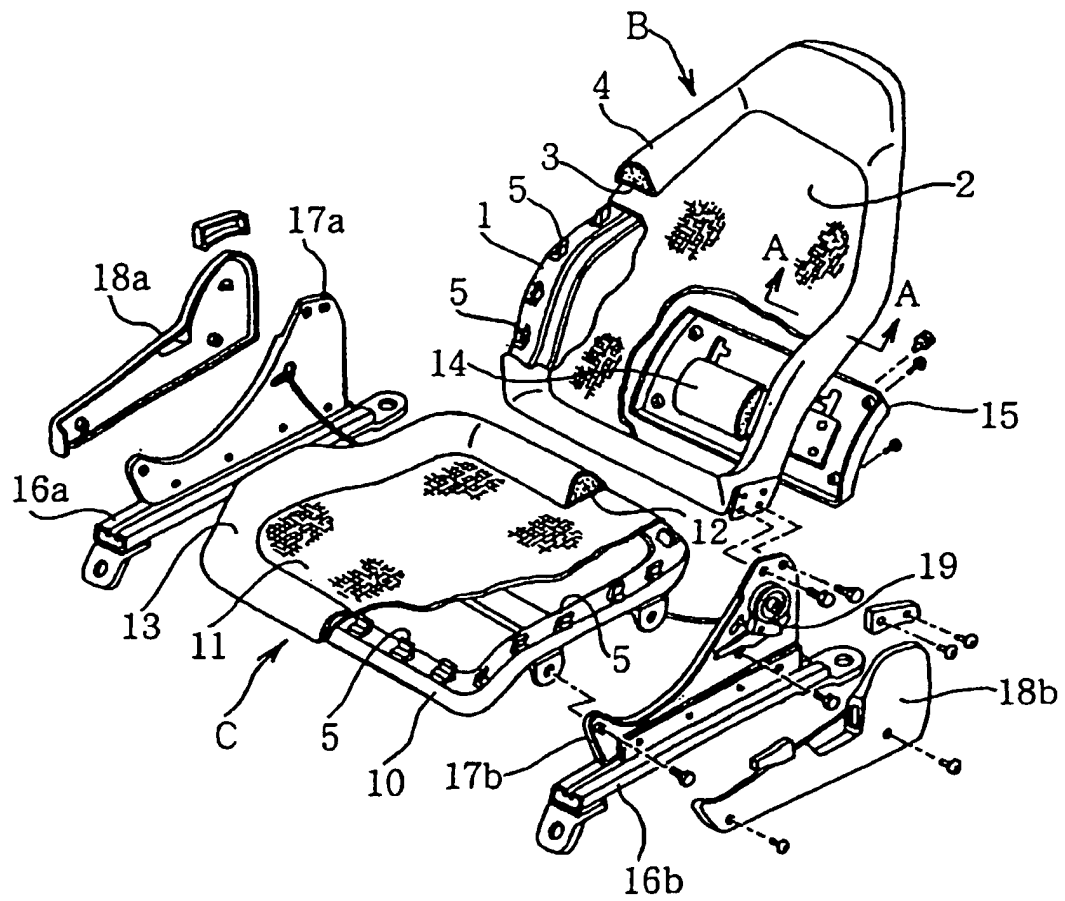


FIG. 1

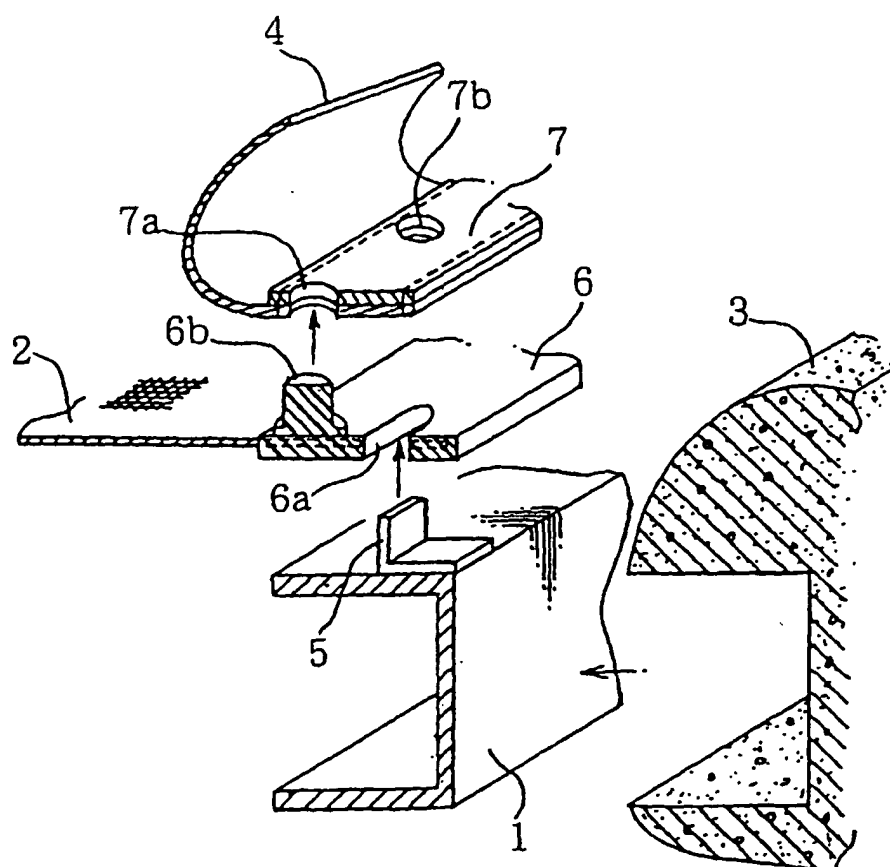


FIG. 2



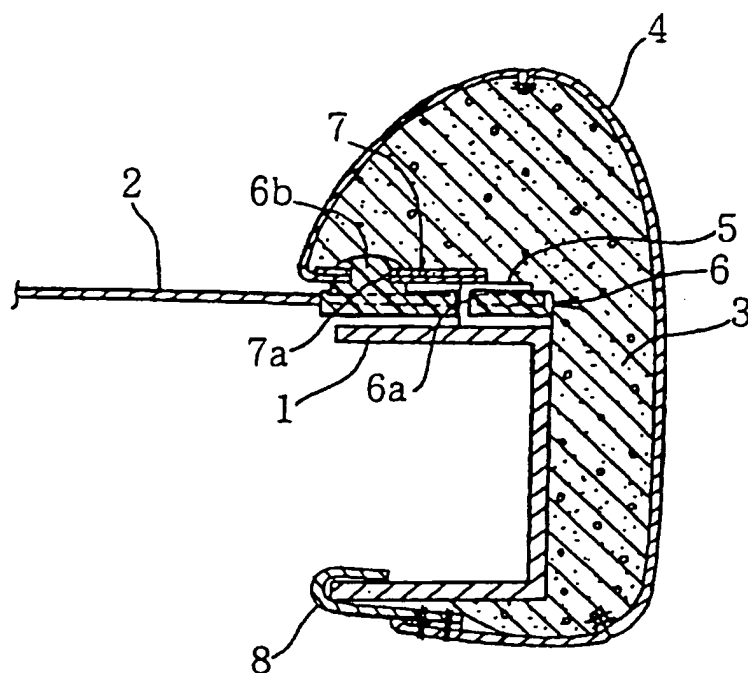


FIG. 3

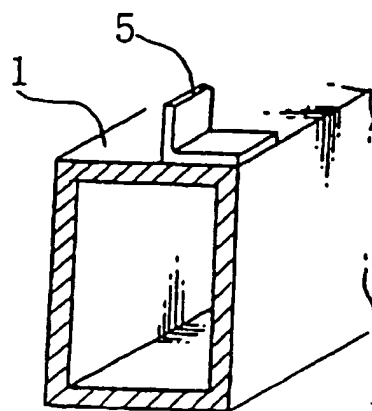


FIG. 4

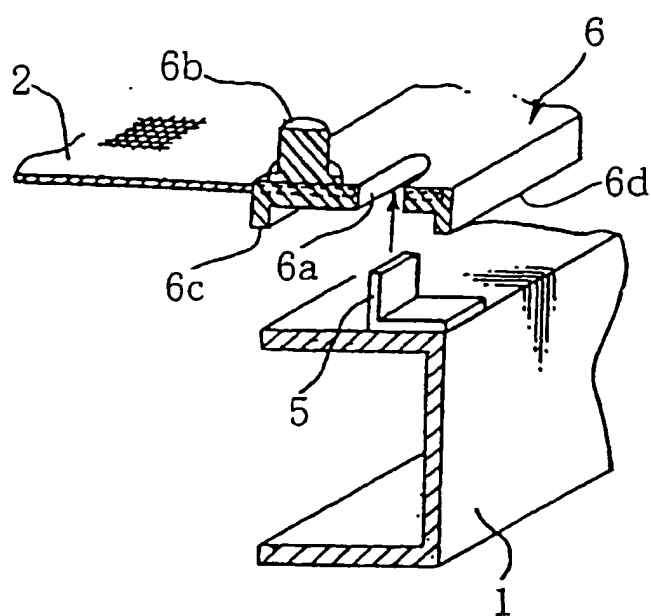


FIG. 5

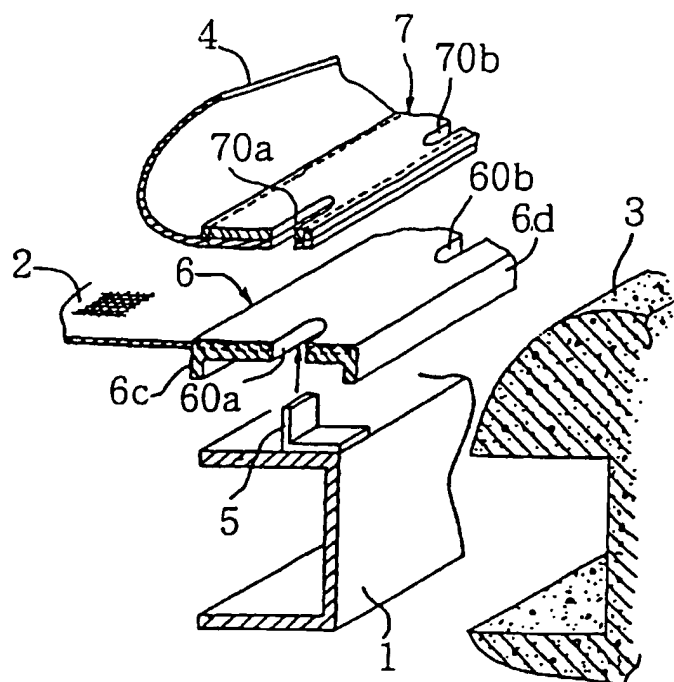


FIG. 6

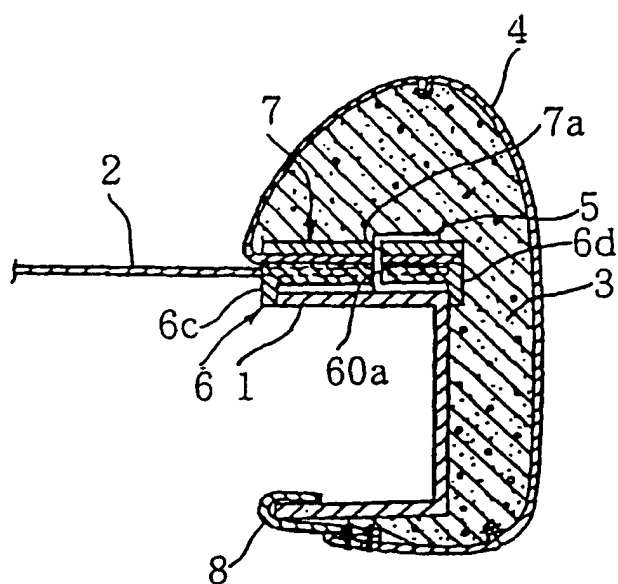


FIG. 7

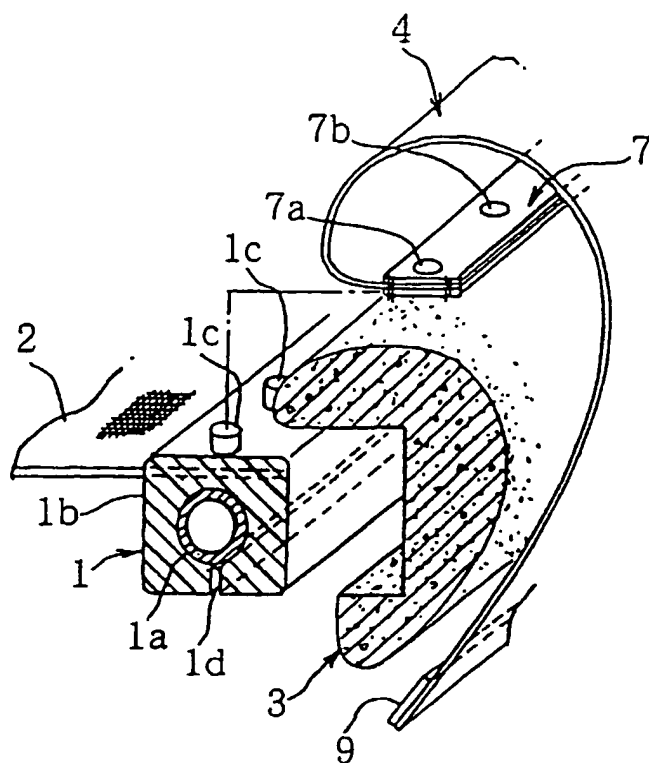


FIG. 8

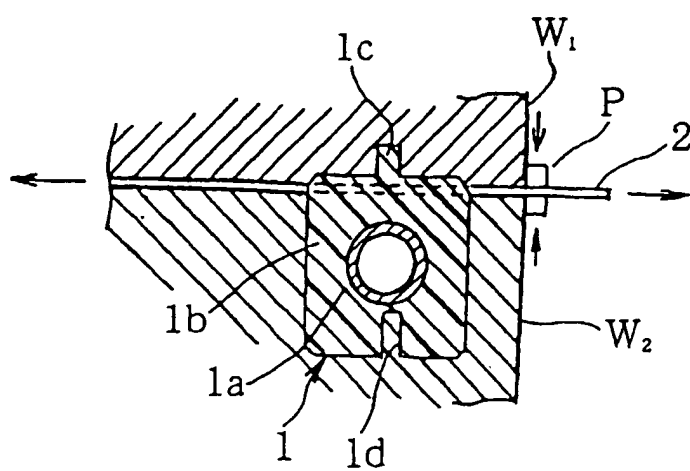


FIG. 9

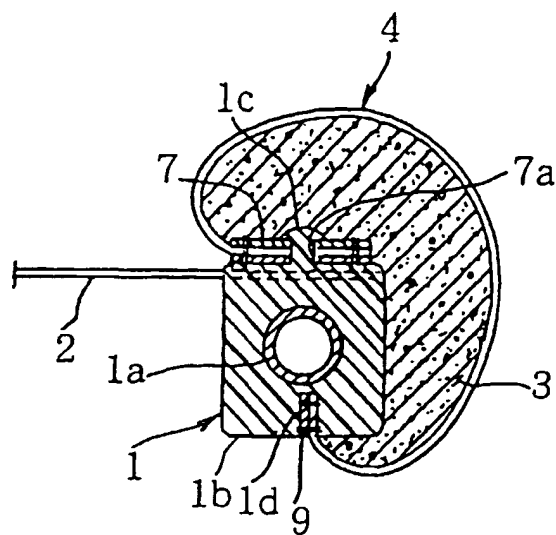


FIG. 10

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP98/05307

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int.Cl. <sup>6</sup> A47C7/28		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) Int.Cl. <sup>6</sup> A47C7/00-7/35, B68G7/05		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1940-1996 Toroku Jitsuyo Shinan Koho 1994-1999 Kokai Jitsuyo Shinan Koho 1971-1999 Jitsuyo Shinan Toroku Koho 1996-1999		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 4-64246, U (Houtoku Co., Ltd.), 2 June, 1992 (02. 06. 92), Full text ; Figs. 1 to 4 (Family: none)	1-7
A	JP, 61-107340, U (Tokyo Sheet K.K., Honda Motor Co., Ltd.), 8 July, 1986 (08. 07. 86), Full text ; Figs. 1, 2 (Family: none)	1-7
A	JP, 55-168437, U (Takashimaya Nippatsu Kogyo K.K.), 3 December, 1980 (03. 12. 80), Full text ; Figs. 1, 2 (Family: none)	1-7
A	JP, 5-83062, B2 (Combi Corp., Meiji Rubber & Chemical Co., Ltd.) 24 November, 1993 (24. 11. 93), Full text ; Figs. 1 to 6 (Family: none)	1-7
A	JP, 63-209611, A (Ikeda Bussan Co., Ltd.), 31 August, 1988 (31. 08. 88), Full text ; Figs. 1 to 8 (Family: none)	1-7
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 22 February, 1999 (22. 02. 99)		Date of mailing of the international search report 2 March, 1999 (02. 03. 99)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP98/05307

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 5-93400, U (Deruta Kougyou K.K.), 21 December, 1993 (21. 12. 93), Full text ; Figs. 1 to 7 (Family: none)	1-7

Form PCT/ISA/210 (continuation of second sheet) (July 1992)